Code Amendment Proposal Application

OMSC 22-01

Department of Consumer & Business Services
Building Codes Division
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APPLICANT INFORMATION	
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PROPOSAL INFORMATION	
Specialty code:	Oregon Mechanical Specialty Code (OMSC)
Code section(s):	Section 401.2
Briefly explain the subject of your proposal:	Clarify the requirement for mechanical ventilation of dwelling units based on the adoption of the air sealing provisions of the Oregon Energy Efficiency Specialty Code
Code Review Committee Outcomes	
Feb. 3 – Disapproved.	

Proposal: IMC 403

Submitted by: Mike Moore, Stator LLC on behalf of Broan-NuTone

Part I: Code Amendment Language

Revise the 2021 IMC as follows:

403.1 Ventilation system. Mechanical ventilation shall be provided by a method of supply air and return or exhaust air ~~except that mechanical ventilation air requirements for Group R-2, R-3 and R-4 occupancies shall be provided by an exhaust system, supply system or combination thereof~~. The amount of supply air shall be approximately equal to the amount of return and exhaust air. The system shall not be prohibited from producing negative or positive pressure. The system to convey ventilation air shall be designed and installed in accordance with Chapter 6.

403.3 Outdoor air and local exhaust airflow rates. Group R-2, R-3, and R-4 occupancies ~~three stories and less in height above grade plane~~ shall be provided with outdoor air and local exhaust in accordance with Section 403.3.2. Other buildings intended to be occupied shall be provided with outdoor air and local exhaust in accordance with Section 403.3.1.

[Note to the committee: This modification combines the ventilation requirements for low-rise and high-rise R-2, R-3, and R-4 dwelling units.]

403.3.1 Other buildings intended to be occupied. The design of local exhaust systems and ventilation systems for outdoor air for occupancies other than Group R-2, R-3 and R-4 ~~three stories and less above grade plane~~ shall comply with Sections 403.3.1.1 through 403.3.1.4.

403.3.2 Group R-2, R-3 and R-4 occupancies~~, three stories and less~~. The design of local exhaust systems and ventilation systems for outdoor air in Group R-2, R-3, and R-4 occupancies ~~three stories and less in height above grade plane~~ shall comply with Sections 403.3.2.1 through 403.3.2.5.

403.3.2.1 Outdoor air for dwelling units. A~~n~~ balanced ~~outdoor air~~ ventilation system ~~consisting of a mechanical exhaust system, supply system or combination thereof~~ shall be installed to provide outdoor air for each dwelling unit ~~Local exhaust or supply systems, including outdoor air ducts connected to the return side of an air handler, are permitted to serve as such a system~~. The ~~outdoor air~~ balanced ventilation system shall be designed to provide the required rate of outdoor air continuously during the period that the building is occupied. The minimum continuous outdoor airflow rate shall be determined in accordance with Equation 4-9.

[Note to the committee: This modification requires balanced ventilation for R-2, R-3, and R-4 dwelling units, which better aligns with the ORSC's requirement for balanced ventilation of dwelling units within its scope.]

Q_{OA}= 0.0~~1~~3A_{floor} + 7.5(N_{br} + 1) [**Equation 4-9**]
where:
Q_{OA} = outdoor airflow rate, cfm
A_{floor} = conditioned floor area, ft^2
N_{br} = number of bedrooms; not to be less than one

[Note to the committee: This modification to Equation 4-9 sets the outdoor air ventilation rate to be equal to the rate in ASHRAE 62.2 for attached dwelling units. This rate is higher than the current OMSC rate for low-rise R-2, R-3, and R-4 dwelling units and approximately equal to the current OMSC requirement for high-rise R-2, R-3, and R-4 dwelling units.]

Exceptions: *[Note to the committee: all other exceptions remain unchanged]*

2. The minimum mechanical ventilation rate determined in accordance with Equation 4-9 shall be reduced by 30 percent provided that ~~both of~~ the following condition~~s apply:~~ applies:
2.1. A ducted system supplies ventilation air directly to each bedroom and to one or more of the following rooms:
2.1.1. Living room.
2.1.2. Dining room.
2.1.3. Kitchen.
~~2.2. The whole-house ventilation system is a balanced ventilation system.~~

[Note to the committee: The language in 2.2 can be removed because it becomes redundant if balanced ventilation is required.by 403.3.2.1.]

Part III: Code Amendment Proposal Criteria

A. Proposal

1. Describe the concept and purpose of this proposal.

This proposal does the following:

a) ***Simplifies the ventilation requirements for Group R dwelling units by expanding the scope of Section 403.3.2 to cover all Group R-2, R-3, and R-4 dwelling units, regardless of the number of stories.*** *Simultaneously, it increases the outdoor airflow rate for low-rise R-2, R-3, and R-4 dwelling units to align with the ASHRAE 62.2-2019 requirement and to be comparable to what is currently required for high-rise R-2, R-3, and R-4 dwelling units in the OMSC. Combining high-rise and low-rise R-2, R-3, and R-4 and simultaneously increasing the rates for the low-rise dwelling units to align with ASHRAE 62.2-2019 is also aligned with the IMC Committee's action on proposal M19-21 (submitted by the PMGCAC and approved by the committee as modified by Summers-1) in April 2021 and is expected to be part of the 2024 version of the IMC.*

Rationale: *Prior to 2019, Oregon used the same mechanical ventilation outdoor airflow rate calculation for all R-2, R-3, and R-4 dwelling units. Beginning in 2019, a new calculation was introduced in Oregon for low-rise R-2, R-3, and R-4 dwelling units, via adoption of the 2018 IMC. This 2019 OMSC outdoor airflow rate calculation for low-rise multifamily dwelling units was based on the ASHRAE 62.2-2010 equation, which was developed for leaky, detached, single-family homes (bad assumption!). Applying this old equation and associated faulty assumptions to tight, attached, low-rise R-2, R-3, and R-4 dwelling units results in airflow rates that are 1/3 to ½ less than what is required by:*

- *the OMSC for all dwelling units within scope, prior to 2019 (1/3 less),*
- *the 2019 OMSC for mid- and high-rise dwelling units (1/3 less),*

- *ASHRAE 62.2-2019 (1/3 less) for non-transient high-rise and low-rise dwelling units, and*
- *ASHRAE 62.1-2019 (1/2 less) for transient dwelling units.*

The 2022 OMSC ventilation rates for R-2, R-3, and R-4 dwelling units should be modified to better align with consensus standards and OMSC versions prior to 2019. This will help avoid under-ventilation that can lead to poor IAQ and negative health outcomes. Avoiding under-ventilating is especially important for IAQ in high-density multifamily dwelling units. Following are calculations showing the outdoor airflow rate (QOA) required by various methods and demonstrating the deficiency of the 2021 IMC outdoor airflow rates for low-rise R-2, R-3, and R-4 dwelling units. The rate calculated is for a 2-bedroom, 800 ft^2 apartment with 8 ft ceilings (volume = 6400 ft^3)

Method A (faulty): 2019 OMSC and 2021 IMC, dwelling units in low-rise R-2, R-3, and R-4 buildings (same equation used in ASHRAE 62.2-2010):

*QOA = 0.01 cfm/ft2*ConditionedFloorArea + 7.5*(NumberBedrooms + 1)*
*= 0.01*800 + 7.5*(2+1)*
= 8 + 22.5
*= **30.5 cfm** [This rate is 1/3 less than the 2014 OMSC, 1/3 less than ASHRAE 62.2-2019, and ½ less than ASHRAE 62.1-2019]*

Method B: 2014 OMSC, all private dwelling units (same equation is used in 2019 OMSC and 2021 IMC for all mid- and high-rise private dwelling units):

QOA = Max [0.35 ACH, (15 cfm/person)(2 persons for first bedroom and 1 person for second bedroom)]*
= Max [0.35ACH(6400 ft3)*(1-hr/60-min), 45]*
= Max [37, 45]
*= **45 cfm***

Method C (supported by this proposal for the 2022 OMSC): ASHRAE 62.2-2019, all non-transient vertically attached dwelling units

*QOA = 0.03 cfm/ft2*ConditionedFloorArea + 7.5*(NumberBedrooms + 1)*
*= 0.03*800 + 7.5*(2+1)*
= 24 + 22.5
***= 46.5 cfm** [This method produces values that are very close to those in Method B (i.e., the 2014 OMSC for all private dwelling units and the 2019 OMSC and 2021 IMC for all for all mid- and high-rise private dwelling units]*

Method D: ASHRAE 62.1-2019, all transient dwelling units:

*QOA = 0.06 cfm/ft2*ConditionedFloorArea + (5 cfm/person)*(2 persons for first bedroom and 1 person for second bedroom)*
*= 0.06*800 + 5*3*
*= 0.06*800 + 5*3*
= 48 + 15
= 63 cfm

b) Establishes a requirement for balanced ventilation of R-2, R-3, and R-4 dwelling units that aligns with the Oregon Residential Specialty Code Section M1505.4 requirement for balanced ventilation of dwelling units within its scope.

Rationale: Where tight building thermal envelopes are provided, it becomes necessary to have balanced ventilation in order to provide adequate ventilation with reduced strain on the thermal envelope itself. The tighter the building envelope, the greater the pressure differential caused by operating unbalanced ventilation systems. Increasing the pressure differential across the building envelope and between dwelling units and common areas can increase the energy use of ventilation fans, cause whistling around doors and windows, increase the driving force associated with the transfer of air across designated air barriers, increase the deposition of moisture within the building envelope, and negatively affect a dwelling unit's indoor air quality by facilitating the transfer of polluted air from adjacent spaces. The proposed requirement for balanced ventilation is aligned with the ORSC's requirement in Section M1505.4 and is even more critical for multifamily dwelling units, where compartmentalization and envelope integrity is more important for fire control and achieving acceptable indoor air quality. Additionally, this proposal is correlated with the 2019 OMSC 601.2, 2019 OSSC 1020.5, and 2019 Oregon Fire Code 1020.5 requirement, which states that "Corridors shall not serve as supply, return, exhaust, relief, or ventilation air ducts." A recent study[1] has shown that approximately 40% of the dwelling unit leakage area of tight, newly constructed multifamily dwelling units is coupled to the corridor. Using an unbalanced ventilation system in such dwelling units is bound to transfer air between the dwelling unit and the corridor in violation of OMSC 601.2 and OSSC 1020.5. For reasons such as these, balanced ventilation for multifamily dwelling units is now required in Washington State and in Minnesota.

2. What problem in the existing Oregon code or national model code is this proposal solving? How does this amendment address the issue? If you have evidence demonstrating the problem, submit that information.

a) If this proposal corrects any unforeseen or probable outcomes resulting from the application of a code section, explain how.

b) If this proposal corrects inadequate application by a code section to a method, material or design, explain how. *Currently, the outdoor air ventilation rate in Oregon for low-rise R-2, R-3, and R-4 is about 1/3 less than what is required by ASHRAE 62.2-2019 and about 1/3 less than what was required in Oregon prior to 2019. The outdoor air ventilation rate in the 2019 OMSC is based on an ASHRAE 62.2-2010 requirement for single family homes, which is not applicable to multifamily structures that are often high-density.*

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[1] Bohac D., and Sweeney L. 2020. Energy Code Field Studies: Low-Rise Multifamily Air Leakage Testing. Prepared by the Center for Energy and Environment, Ecotope, and The Energy Conservatory. Prepared for the U.S. Department of Energy Office of Energy Efficiency & Renewable Energy. https://www.energycodes.gov/sites/default/files/documents/LRMF_AirLeakageTesting_FinalReport_2020-07-06.pdf. [See Table 45, which shows average leakage to "common" area of 42%. The report also notes, "for buildings in this study, "common areas" are made up almost completely of corridors and a few small rooms such as mechanical closets and elevator rooms.]

c) If this proposal eliminates conflicting, obsolete, or duplicative code provisions or standards between Oregon-adopted codes, statutes or regulations, explain why.

d) If this proposal is for a fire or life safety matter, or is it otherwise needed to protect the health, safety, welfare, comfort and security of occupants and the public, explain why. *Better aligning mechanical ventilation rates with consensus standards supports public health through facilitating acceptable indoor air quality. Further, requiring balanced ventilation minimizes pressure differentials between multifamily dwelling units and adjacent spaces, which is expected to improve indoor air quality by minimizing transfer of polluted air from adjacent spaces and supporting the requirement that "Corridors shall not serve as supply, return, exhaust, relief, or ventilation air ducts." Achieving this code requirement is important to maintain life safety and indoor air quality, as evinced by it being repeated 3 times in Oregon's code (2019 OMSC 601.2, 2019 OSSC 1020.5, and 2019 Oregon Fire Code 1020.5).*

e) If this proposal is necessary to address unique geographic or climatic conditions within Oregon, explain why.

f) If there are alternatives to this proposal that solve the problem, explain why this proposal is the best or a necessary solution.

g) If this proposal provides for the use of unique or emerging technologies, or promotes advances in construction methods, devices, materials and techniques, explain how.

h) If this proposal meets any energy conservation or indoor air quality requirements, explain how. *This proposal better aligns OMSC ventilation rates with consensus standards on indoor air quality. By requiring balanced ventilation, this proposal will reduce pressure imbalances across dwelling units in support of indoor air quality and life safety provisions of Oregon's code (2019 OMSC 601.2, 2019 OSSC 1020.5, and 2019 Oregon Fire Code 1020.5).*

i) If this proposal involves the adoption of an electrical or plumbing building product, note if the appropriate advisory board approved the product.

3. Has this been proposed at the national model code level. If so, explain when it was proposed, what happened, and why it was not adopted. Provide all associated national model code hearing information and background. *A proposal to increase in the outdoor airflow rate (modification of Equation 4-9) and to combine of R-2, R-3, and R-4 dwelling units into one section was proposed to and approved by the IMC Committee at the April 2021 Committee Action Hearings (see M19-21, submitted by the PMGCAC and approved by the committee as modified by Summers-1). This language is expected to be part of the 2024 version of the IMC. In the development of this proposal, no proposals to require balanced ventilation at the national level were identified.*

B. Implementation and fiscal impact

1. Explain how the proposed provisions would be enforced? Are additional inspections or permits required? Describe any necessary equipment, training, tests or special certifications. *The 2021 IMC already requires mechanical ventilation of any dwelling unit complying with the air sealing requirements of ASHRAE 90.1. Because provision of mechanical ventilation is already required to be enforced, it can be relatively straight-forward to verify the system type. No additional permits or inspections are*

anticipated. Training materials should incorporate a section on R-2, R-3, and R-4 ventilation with a summary of the requirements in this section.

2. What is the fiscal impact of this proposal? Provide a cost benefit analysis and include the resources or methods you used to determine the fiscal impact.

> a) If this proposal adds to the cost of construction, explain how the added cost contributes to the health and safety of occupants, or is necessary to conserve scarce resources. *This proposal will increase the cost of construction. A balanced system could be a simple supply fan + exhaust fan solution with integrated controls with a low first-cost, or it could be a heat or energy recovery ventilator, which has a higher initial cost. ASHRAE 90.1 and the Oregon Energy Efficiency Specialty Code currently require heat or energy recovery ventilators (H/ERVs) to be provided for most R-2, R-3, and R-4 dwelling units in the prescriptive path, based on H/ERVs meeting the cost effectiveness criteria of ASHRAE 90.1 for Oregon's climate zones. In addition to being a cost-effective solution, a balanced system can contribute to the health and safety of occupants, as noted in the rationale presented in Part IIIA1b, Part IIIA2d, and PartIIIA2h.*
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> b) If there are any other adverse fiscal impacts or cost savings passed on to the general public, the construction industry, local and state governments, and small businesses, an interested person must describe the added or reduced cost of a proposed code amendment, and describe the adverse fiscal impact or cost savings in relation to the current Oregon specialty code.
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> c) If this proposal will affect the cost of development of a detached single-family dwelling, please indicate the cost. For the purposes of illustrating the change on the cost, please use a 6,000-squarefoot parcel and the construction of a 1,200-square-foot detached single-family dwelling on that parcel. The information on the cost must be sufficient to assist the division in preparing a housing cost impact statement.

C. Impacted stakeholders and other specialty codes

1. It is important that proposals be shared with stakeholders that will be impacted by them. Was this proposal developed with people or organizations likely to be affected by it? Has it been reviewed or shared with people or organizations likely to be affected by it? If so, who, and if not, why not? *The components of this proposal that modify the ventilation rate and combine all Group R-2, R-3, and R-4 dwelling units into one section were developed and proposed by the ICC Plumbing, Mechanical, and Gas Code Action Committee as a modification to the 2021 IMC within the current ICC Group A code maintenance cycle. During this public process involving a wide array of stakeholders, the proposal was approved by the IMC Committee. The component of this proposal requiring balanced ventilation of multifamily dwelling units is aligned with similar actions taken in Oregon, Washington, Minnesota, and other U.S. and Canadian jurisdictions that have involved stakeholder debate.*

2. Does this proposal impact other specialty codes or statewide programs? *This proposal coordinates with requirements in the OEESC (i.e., prescriptive path requirement for H/ERVs in dwelling units), the ORSC (balanced ventilation requirement for dwelling units), and the indoor air quality and life safety provisions of 2019 OMSC 601.2, 2019 OSSC 1020.5, and 2019 Oregon Fire Code 1020.5.*